Remarks

I. Status of the Application and Claims

As originally filed, the present application had a total of 10 claims. All of these remain pending after the present response, with claims 2 and 8 having been amended.

II. The Amendments

Both claims 2 and 8 underwent minor amendments to obviate rejections made by the Examiner under 35 U.S.C. § 112, second paragraph. Specifically, claim 2 was amended to remove a clause beginning with the word "particularly" and claim 8 was amended to replace the word "whereby" with the phrase "and further wherein." Neither of these amendments adds new matter to the application, their entry is therefore respectfully requested.

The Rejections

On pages 2 and 3 of the Office Action, the Examiner rejects claims 1-10 under 35 U.S.C. § 103 as being unpatentable over Kunkel (U.S. 4,428,923) in combination with Kuerten (U.S. 4,234,560). The Examiner alleges that the Kunkel reference discloses the general hydrogenation process described by Applicants in which gas and liquid are mixed using a jet nozzle. Although the reference does not teach that waste hydrogen gas should be compressed using a jet pump with the liquid or gaseous feedstock being used as the motive agent, the Examiner argues that these missing elements are supplied by Kuerten. In particular, the Examiner cites column 1, lines 37-44 as teaching that it is possible to disperse gas in liquid by means of a jet pump and argues that it would be obvious from this disclosure to use a jet pump for recycling waste hydrogen gas in the process of Kunkel. It is also argued that it would be obvious to use liquid or gaseous feedstock as the motive of force for the pump since one of ordinary skill in the art would recognize this as a convenient and economically advantageous source. Finally, the Examiner cites Korl *et al.* (U.S. 6,861,042), as disclosing a continuous catalytic hydrogenation process in which reaction mixture is recirculated and Ellis (U.S. 6,342,199) as disclosing a process for conducting a chemical reaction characterized by an equilibrium in a reaction system designed as a loop reactor.

For the reasons provided below, Applicants respectfully traverse this rejection.

A. Neither Kunkel Nor Korl Teach the Recycling of Waste Hydrogenation Gas

Applicants respectfully submit that the Examiner has not properly construed the disclosure of Kunkel et al with respect to the composition of the waste hydrogenation gas. The Examiner refers to column 2, lines 54-56 as disclosing that hydrogen which is not reacted must be recycled. However, this part of the text refers to prior art processes and not to the process disclosed by Kunkel *et al.* In the process of Kunkel *et al.*, all hydrogen is converted in a single pass through the reactor and the waste hydrogenation gas therefore contains only inert gases. This is clearly disclosed in column 4, lines 26-29. Therefore, a skilled person would have no motivation to recycle the waste hydrogenation gas obtained in the process of Kunkel *et al.* back to the hydrogenation reactor because this waste gas does not contain any unconverted hydrogen gas. This same argument also applies to the process of Korl *et al.* which also operates on the principle of complete conversion of hydrogen in a single pass.

B. Kuerten *et al.* and Ellis Do not Teach the Use of a Feedstream for Providing a Motive Force

Applicants also submit that the processes of Kuerten *et al.* and Ellis, which disclose a recycle of unreacted gas, are both concerned with processes where the motive force used for recycling the gas into the reaction is provided by the circulating stream of a loop reactor. Therefore, even if a skilled person would consider using the process of Kunkel *et al.* with an incomplete conversion of hydrogen, thereby resulting in a hydrogenation waste gas containing unreacted hydrogen, the disclosures of Kuerten *et al* or Ellis would only motivate him to use the liquid stream in loop 4a as a motive force for recycling unreacted hydrogen. There is nothing in the cited prior art to suggest the use of a feedstream for that purpose.

C. Kuerten Teaches Away from the Use of Jet Pumps

The section of the Kuerten reference cited by the Examiner (col. 1, lines 37-44) is discussing background art and problems with procedures previously used in processes involving the mixing of gas and liquid. The relevant portion of the cited text reads:

> Ejectors above all have the disadvantage that the compression efficiency is low. The jet must therefore have a very high energy in order to recompress the gas at the top of the reactor against the static pressure of the liquid column.

A careful reading of this quote, when taken in context, should make it apparent that the Kuerten reference is *not* suggesting the use of jet pumps to compress gas, but rather providing a reason why these pumps should generally be avoided, *i.e.*, because of the high compression pressures that they require. When describing their own invention, the Kuerten inventors do *not* use a jet pump for compressing waste gas as claimed by Applicants. Given the absence of a jet pump from their own invention and the negative teachings concerning the use of such pumps in the prior art, it is difficult to see how the Kuerten reference could be viewed as providing a motivation to use jet pumps with any procedure, including the procedure that is taught by Kunkel.

D. Kuerten Does Not Disclose the Use of Pumps Relying on Reaction System Pressures to Generate a Motive Force

In addition, the Kuerten reference does not provide any information concerning the way in which the pumps have been used or the particular types of jet pumps that have been employed in different procedures. The Examiner suggests that it would be obvious to use these pumps for compressing waste hydrogen gas, but there are no teachings in the references to support this. In this regard, it should be noted that there are a variety of jet pumps that are available and not all of them depend upon pressures generated in a reaction system to generate a motive force. For example, in some cases, jet pumps rely upon the same system as centrifugal pumps for generating force.

A main element in Applicants' claimed invention is the recognition that, by arranging pressures in the reaction system such that the gaseous or liquid feedstock is fed into hydrogenation reactors at a pressure greater than the pressure at which compressed hydrogen is fed into the reactor, a simple and workable alternative to mechanical compression is available. This is not recognized in the references cited by the Examiner. In fact, the Kuerten reference refers to prior art procedures involving compression of gas as requiring high energy input jet pumps or requiring expensive when gas compressors (see col. 1, lines 32-44).

E. Applicants Believe the Examiner Has Relied Upon a Hindsight Reconstruction of the Claimed Invention

Finally, Applicants respectfully point out that the reason given by the Examiner for the use of a jet pump in which motive force is provided by a gas or liquid feedstock is, essentially, that this is the best solution to the problem. This amounts to an impermissible hindsight reconstruction of Applicants' invention. In the absence of any teachings in the art to support a rejection on obviousness grounds, Applicants respectfully submit that it cannot reasonably be maintained.

F. Summary

Applicants respectfully submit that; a) the Kunkel and Korl references do not teach systems in which hydrogenation gas is recycled; b) Kuerten and Ellis do not teach a system in which motive force is provided by a reaction feedstream; c) the Kuerten reference teaches away from the use of jet pump compression in hydrogenation reactions and therefore provides no motivation to combine its teachings with those of Kunkel; d) to the extent jet pumps are disclosed by the cited references, no distinction is made between the types of pumps that are available and there is no recognition that problems associated with high energy required for compression can be avoided by using liquid or gas feedstock streams to provide the motive force for compression; and e) allegations that elements required by Applicants' claims that would be missing even if cited references were combined would, nevertheless, be obvious, are unsupported by any prior art teachings and amount to a hindsight reconstruction of Applicants' claimed invention.

Conclusion

In light of the amendments and discussion above, Applicants believe that all of the Examiner's rejections have been overcome. It is therefore respectfully requested that these rejections be withdrawn and that the claims now pending be allowed. Early notice to this effect is earnestly solicited.

If, in the opinion of the Examiner, a phone call may help to expedite the prosecution of this application, the Examiner is invited to call Applicants' undersigned attorney at (202) 419-7013.

Respectfully submitted,

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